# Post-Jurassic Sedimentary History of the Eastern Gulf of Mexico

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## EXTENDED ABSTRACT

**Using an extensive 2D seismic grid, nine depositional episodes (depisodes) bounded by marine flooding surfaces have been defined for the Mesozoic-Cenozoic section in the eastern Gulf of Mexico Basin. Spatial and temporal variations of each sequence reveal basin sedimentary history. These observed sequence depositional patterns reflect the imprint of the global sea-level changes.**

**The sedimentation rate was relatively low during the Jurassic depisode (672 ft/m.y.), and the depocenter was in the Destin Salt Basin in the north-northwest. The rate successively decreased in the Early-Early Cretaceous and Late-Early Cretaceous depisodes (242 and 551 ft/m.y.) with depocenters in the Destin Salt and Tampa basins. The Late Cretaceous depisode has a significantly-decreased sedimentation rate (143 ft/m.y.) and the main depocenter filled the West Florida Basin. Sedimentation rate slightly increased until the Paleogene depisode (152 ft/m.y.). Depocenters of the Paleogene depisode occurred entirely landward of the present shelf edge in the Tampa Basin. Sedimentation rate increased at the beginning of the Early to Middle Miocene depisode (416 ft/m.y.), shifting the depocenters into Main Pass and Mississippi Canyon areas. Sedimentation rate dramatically increased in the Late Miocene depisode with depocenter occurring primarily in the Mississippi Canyon and Main Pass areas seaward of the present shelf edge. Sedimentation rate increased to 2614 ft/m.y. in the Pliocene and depocenter shifted further basinward relative to the Miocene depisodes and filled the Mississippi Canyon. Sedimentation rate currently is at its Cenozoic maximum (5764 ft/m.y.) and the depocenter has moved further south and southeast and is filling the West Florida Basin.**

**…**

He, L., 2016, Post-Jurassic sedimentary history of the eastern Gulf of Mexico: Gulf Coast Association of Geological Societies Transactions, v. 66, p. 759–762.

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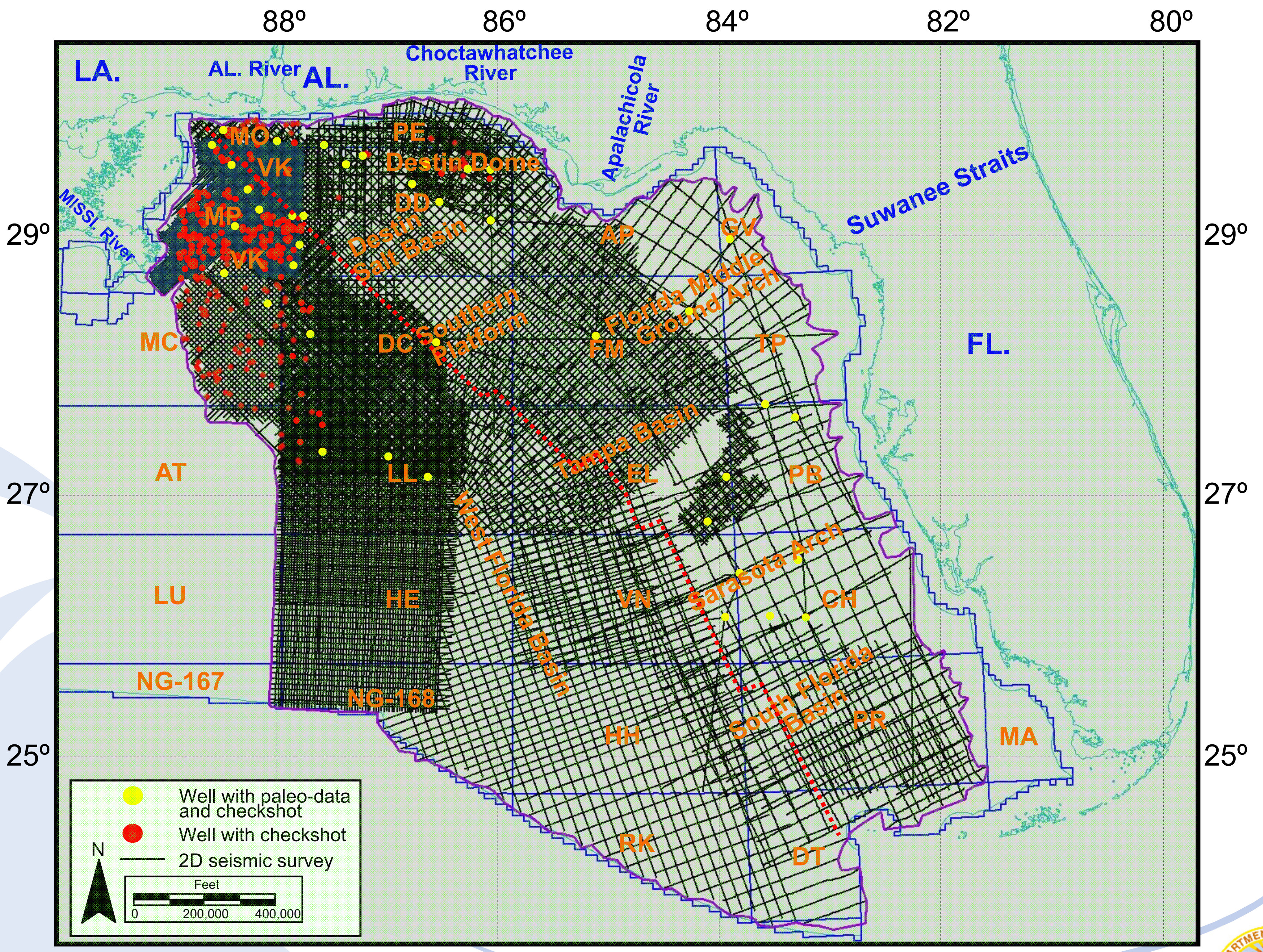
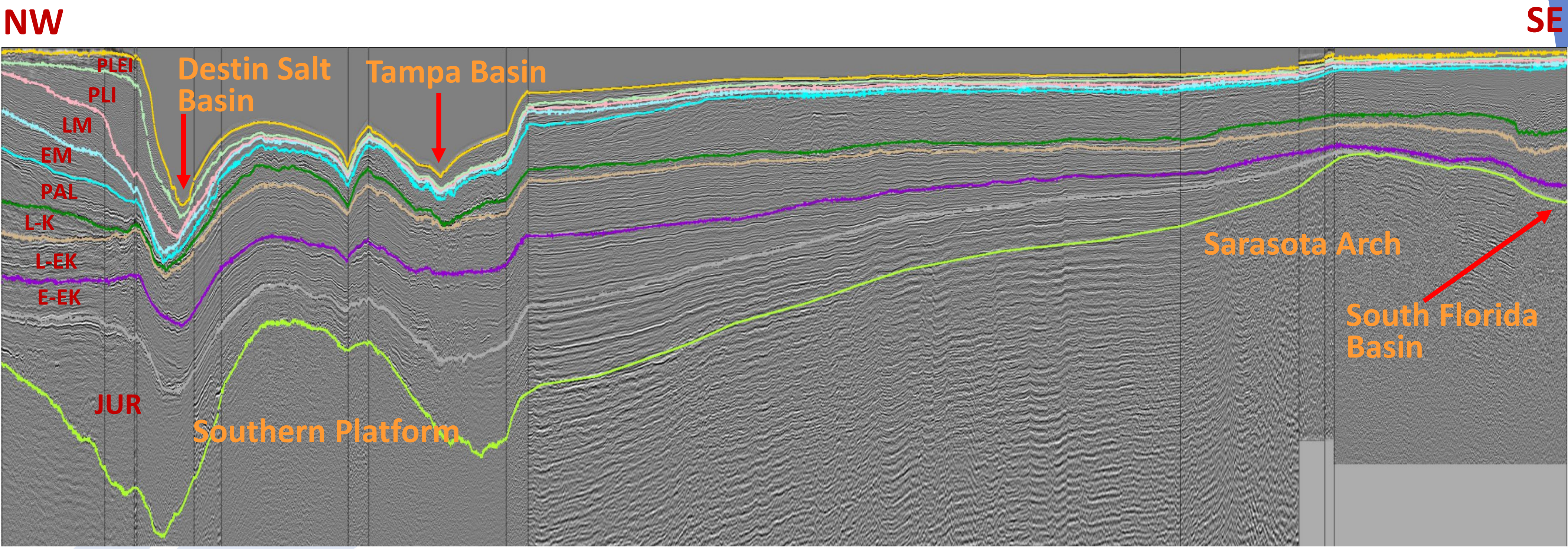

88º
86º
84º
82º
80º
29º
27º
25º
LA.
AL. River
AL.
Choctawhatchee River
Apalachicola River
MISSI. River
Suwanee Straits
FL.
MO
VK
PE
Destin Dome
DD
MP
VK
Destin Salt Basin
AP
GV
Florida Middle Ground Arch
Southern Platform
MC
DC
FM
TP
Tampa Basin
AT
LL
EL
PB
West Florida Basin
Sarasota Arch
LU
HE
VN
CH
NG-167
NG-168
South Florida Basin
HH
PR
MA
RK
DT
Well with paleo-data and checkshot
Well with checkshot
2D seismic survey
N
Feet
0
200,000
400,000

Study Area



NW
SE
PLEI
PLI
LM
EM
PAL
L-K
L-EK
E-EK
JUR
Destin Salt Basin
Tampa Basin
Southern Platform
Sarasota Arch
South Florida Basin

**Sedimentation rate** is calculated over the Depocenter.

Sed. Rate (ft/m.y.) =

Average thickness of the depocenter (ft)/Time span of the depisode (m.y.)

Decompaction Data are based on the wells inside the Depocenters

Decompaction Formula (Pigott, 1990):

$$Zy = Zt*(1- \phi t)/(1- \phi y)$$

Zy – thickness after Decompaction

Zt – present day thickness

ϕy – original porosity of the sediment

ϕt – present day porosity of the sediment

# Backstripping Table
# &
# Sedimentation Rate

| Depisodes | Wells | Thickness wells(ft) | Thickness depocenters (ft) | Shϕ (today) | Ssϕ (today) | Carb.ϕ (today) | Sh ϕ (original) Pigott,1990 | Ss ϕ (original) Pigott,1990 | Carb.ϕ (original) Pigott,1990 | Decompaction Thickness(ft) Depocenters | Age m.y. | Decomp. Sed. Rate of depocenters ft/m.y. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jurassic | DD422 | 4980(sh75%,ss20%,carb5%) | 11500 | 8.10% | 10.50% | 8.75% | 52% | 34% | 30% | 20700 | 30.8 | 672 |
| E-early K | DD422 | 5055(carb85%,sh12%,ss3%) | 6000 | 7.90% | 12% | 10.80% | 52% | 34% | 30% | 7757 | 32 | 242 |
| L-early K | DD422 | 5797(carb85%,sh12%,ss3%) | 5800 | 7.50% | 16.50% | 11.90% | 52% | 34% | 30% | 7333 | 13.3 | 551 |
| L-K | LL399 | 1905(carb80%,sh15%,ss5%) | 3700 | 7.50% | 17% | 11.80% | 52% | 34% | 30% | 4863 | 33.9 | 143 |
| Paleogene | PB7 | 5100(carb95%,sh5%) | 5000 | 7% | | 12% | 52% | 34% | 30% | 6250 | 41.2 | 152 |
| E-M Miocene | MC391 | 2595(sh90%,ss10%) | 2800 | 6.50% | 18% | | 52% | 34% | 30% | 5247 | 12.6 | 416 |
| L-Miocene | MC391 | 4975(sh95%,ss5%) | 7000 | 6.75% | 12% | | 52% | 34% | 30% | 13090 | 5.88 | 2226 |
| Pliocene | MC391 | 4250(sh95%,ss5%) | 5000 | 6.80% | 15% | | 52% | 34% | 30% | 9280 | 3.55 | 2614 |
| **Pleistocene** | LL399 | 5300(sh95%,ss5%) | 5500 | 6.90% | 19% | | 52% | 34% | 30% | 10203 | 1.77 | 5764 |

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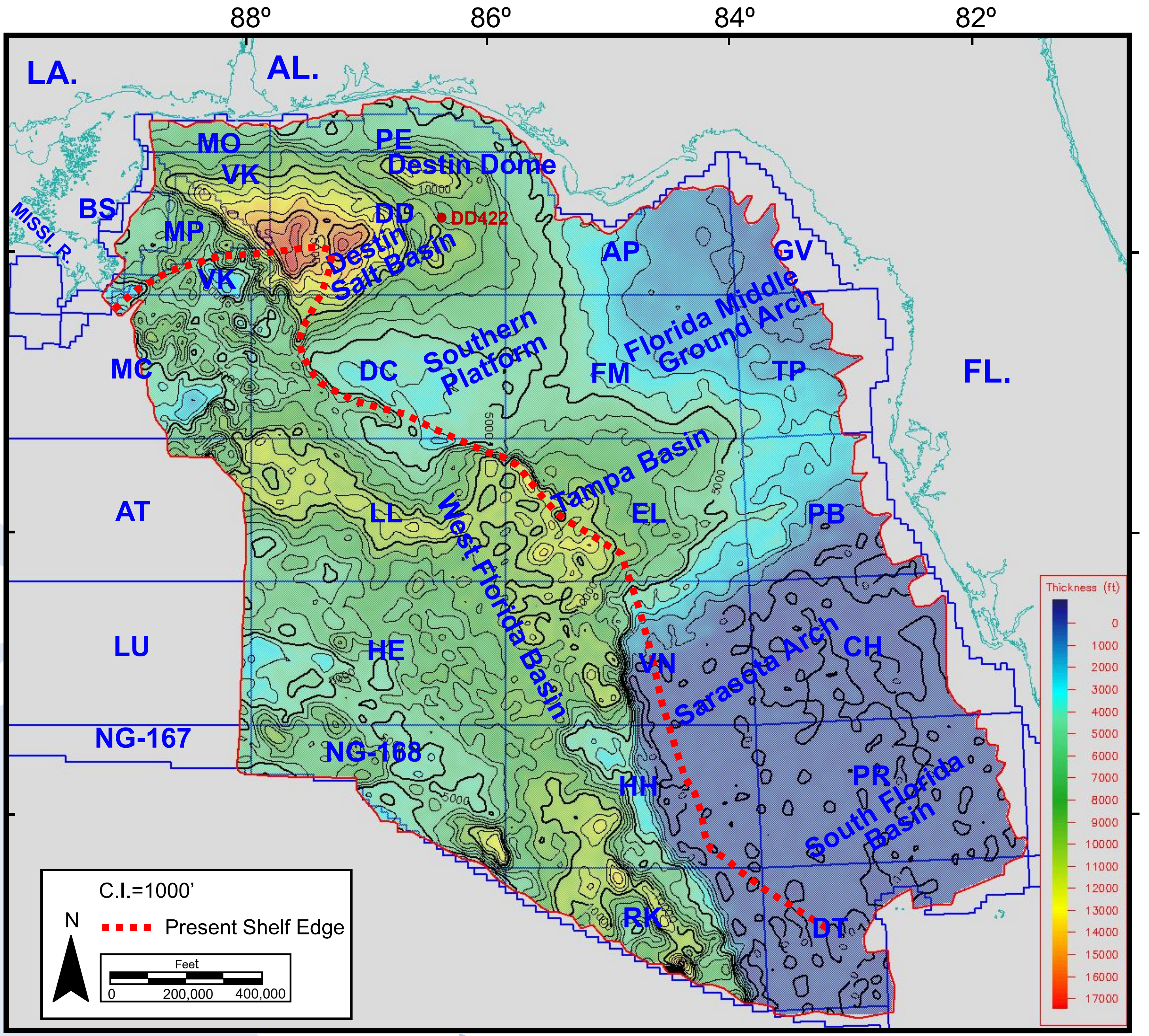
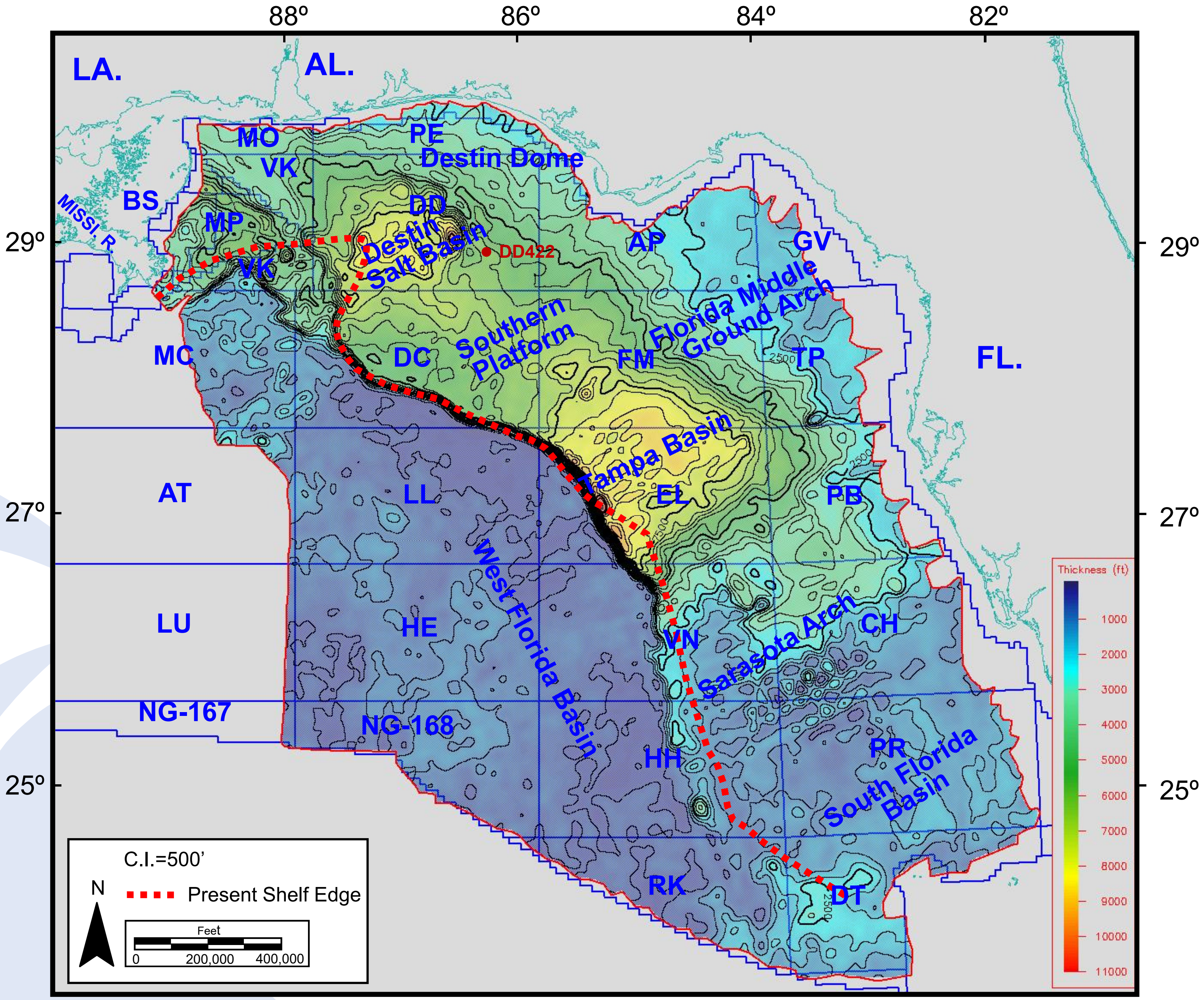
March 3, 1849




Jurassic Depisode (175-144.2 m.y.)




E-Early Cretaceous Depisode (144.2-112.20 m.y.)

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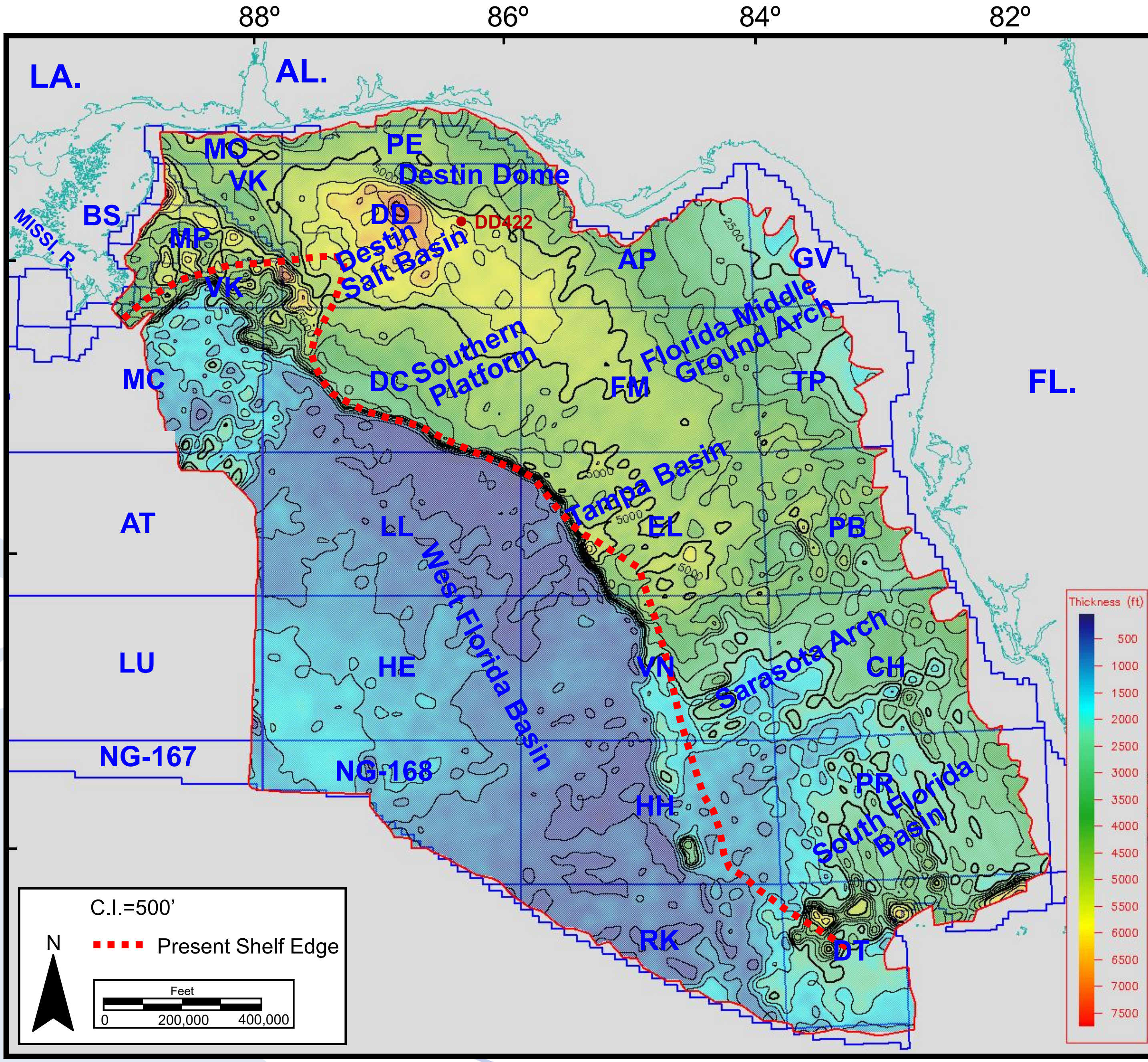


L-Early Cretaceous Depisode (112.20-98.90 m.y.)

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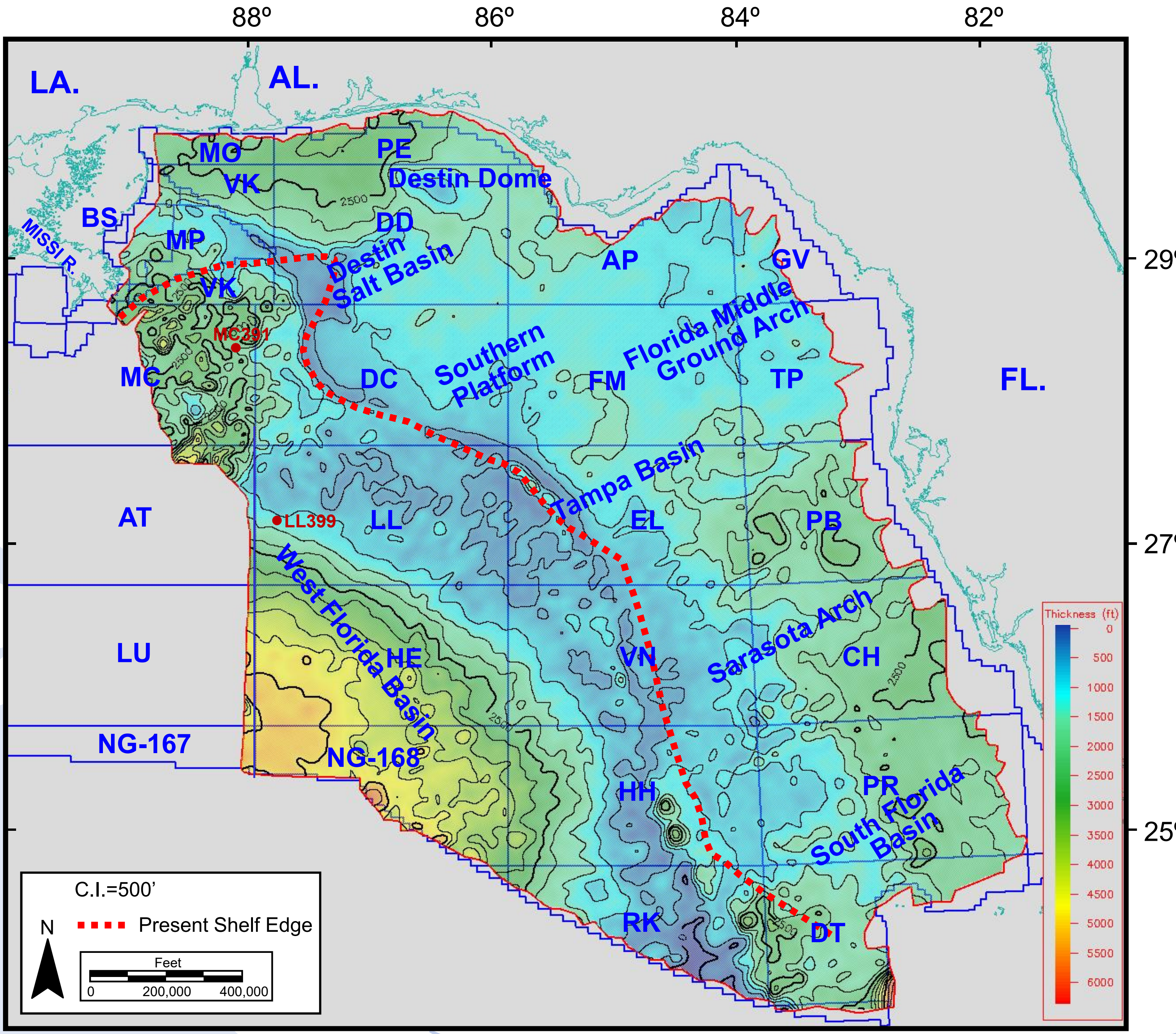
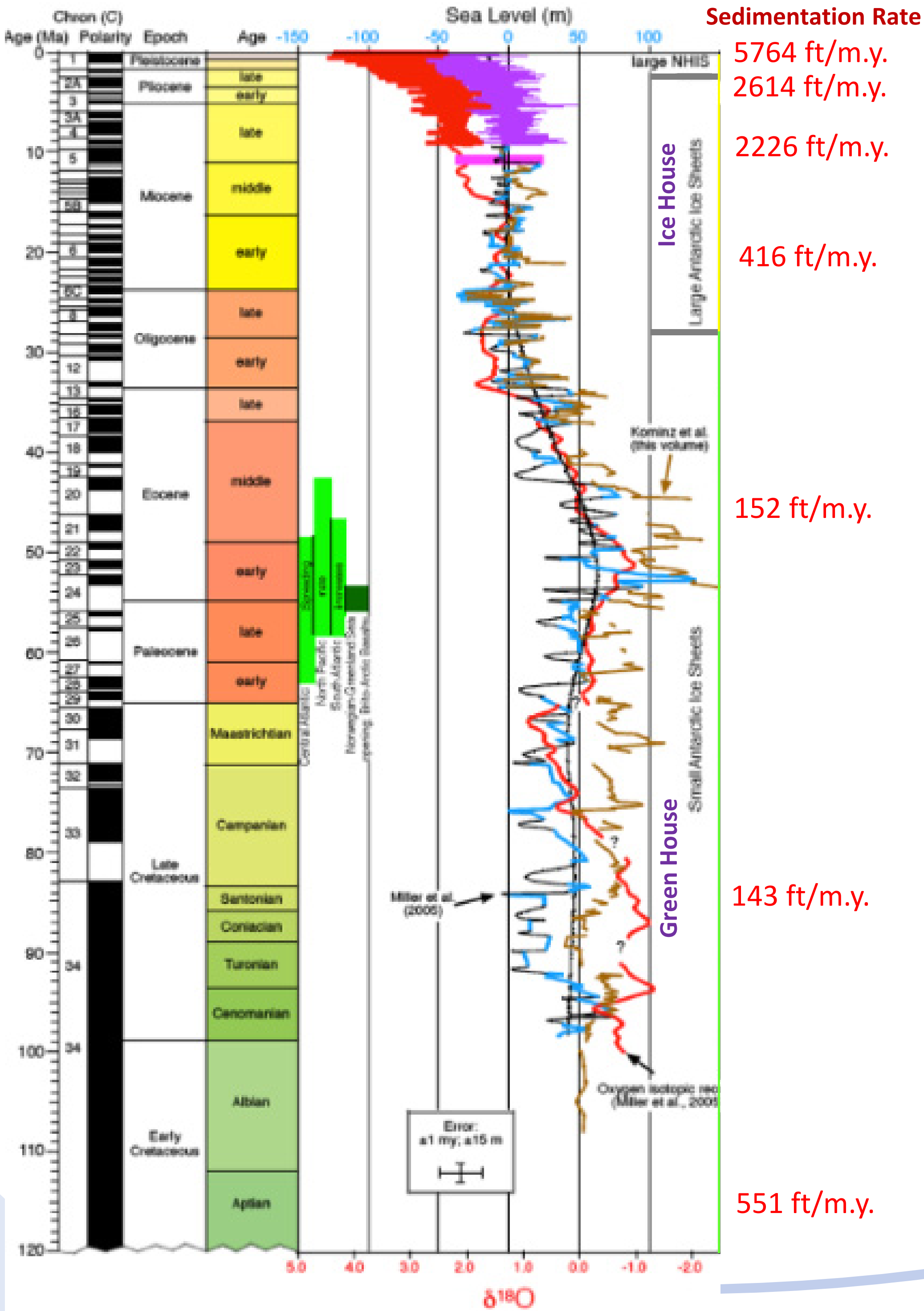



Late Cretaceous Depisode (98.90-65.00 m.y.)




Post 100 m.y. Sea Level from Miller’s study (2005)

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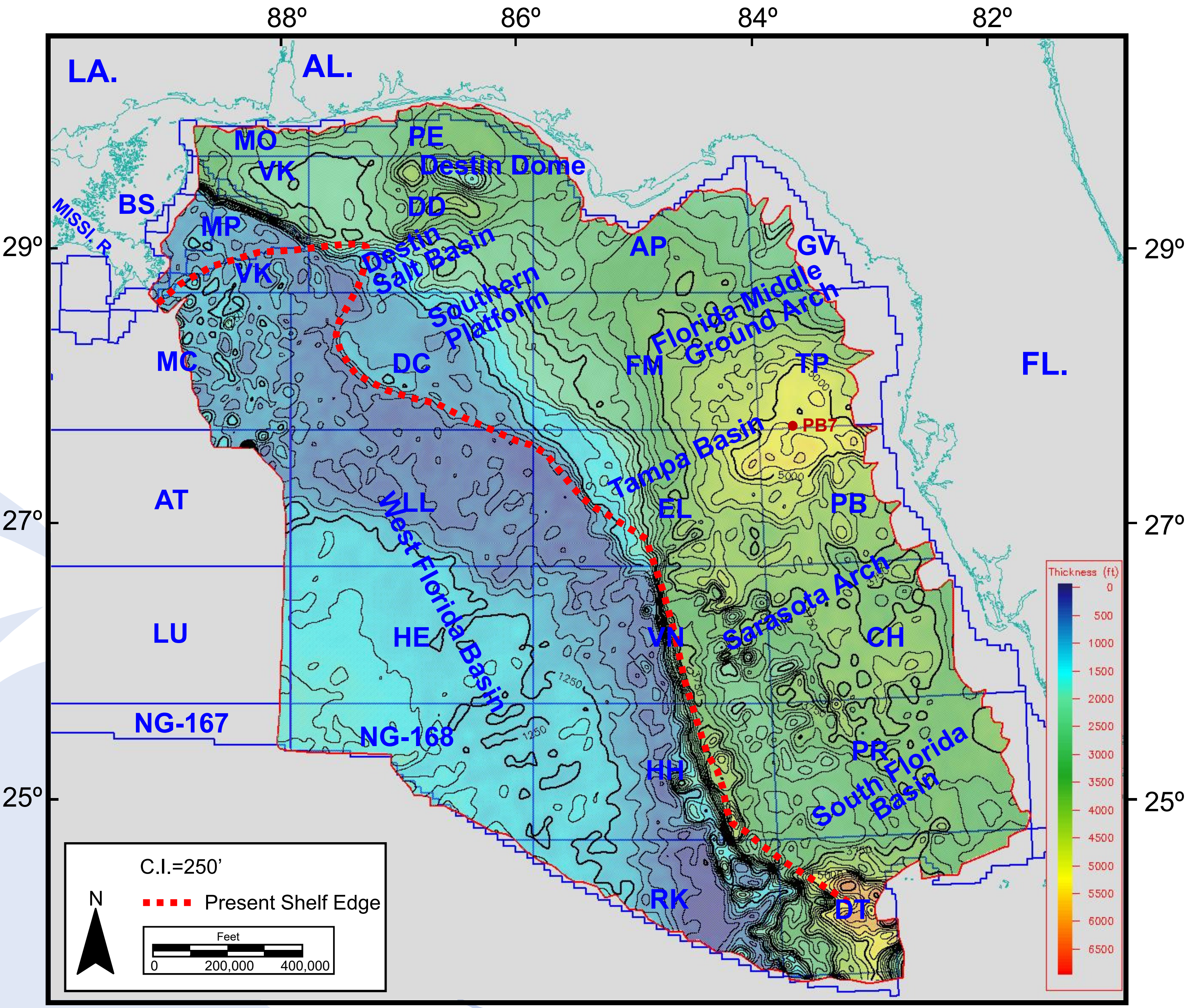


Paleogene Depisode (65.00-23.80 m.y.)

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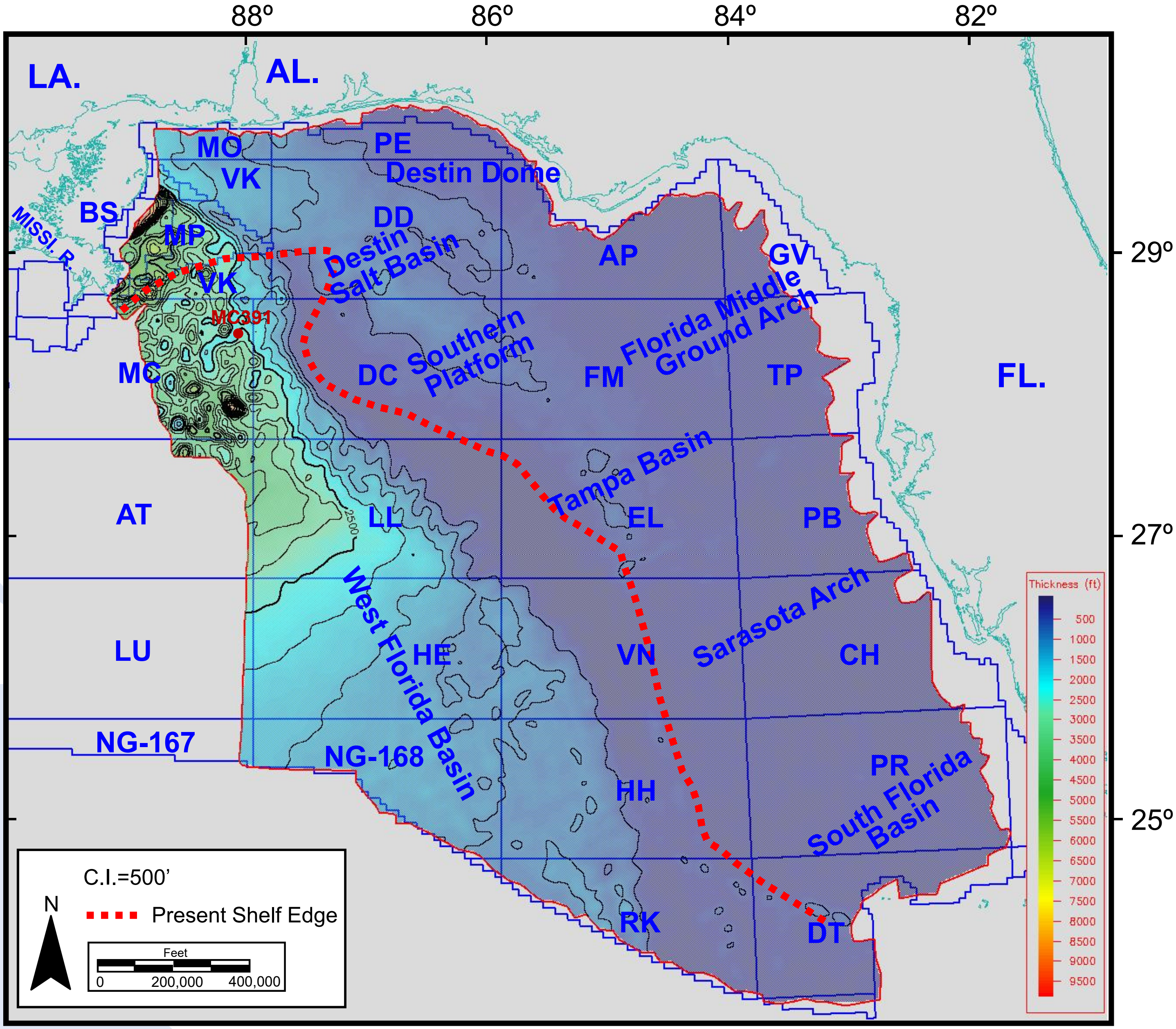


Early to Middle Miocene Depisode (23.80-11.20 m.y.)

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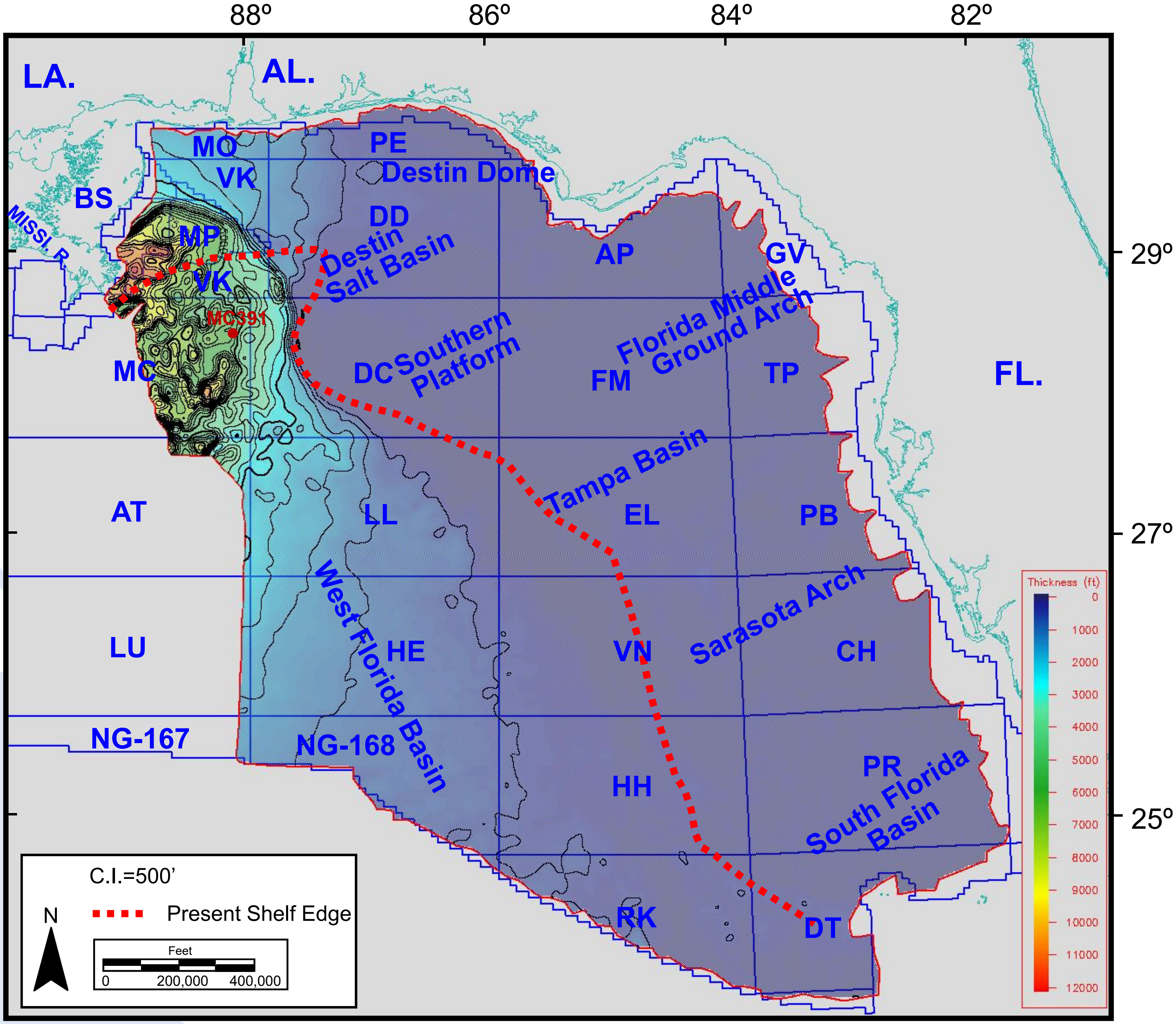


Late Miocene Depisode (11.20-5.32 m.y.)

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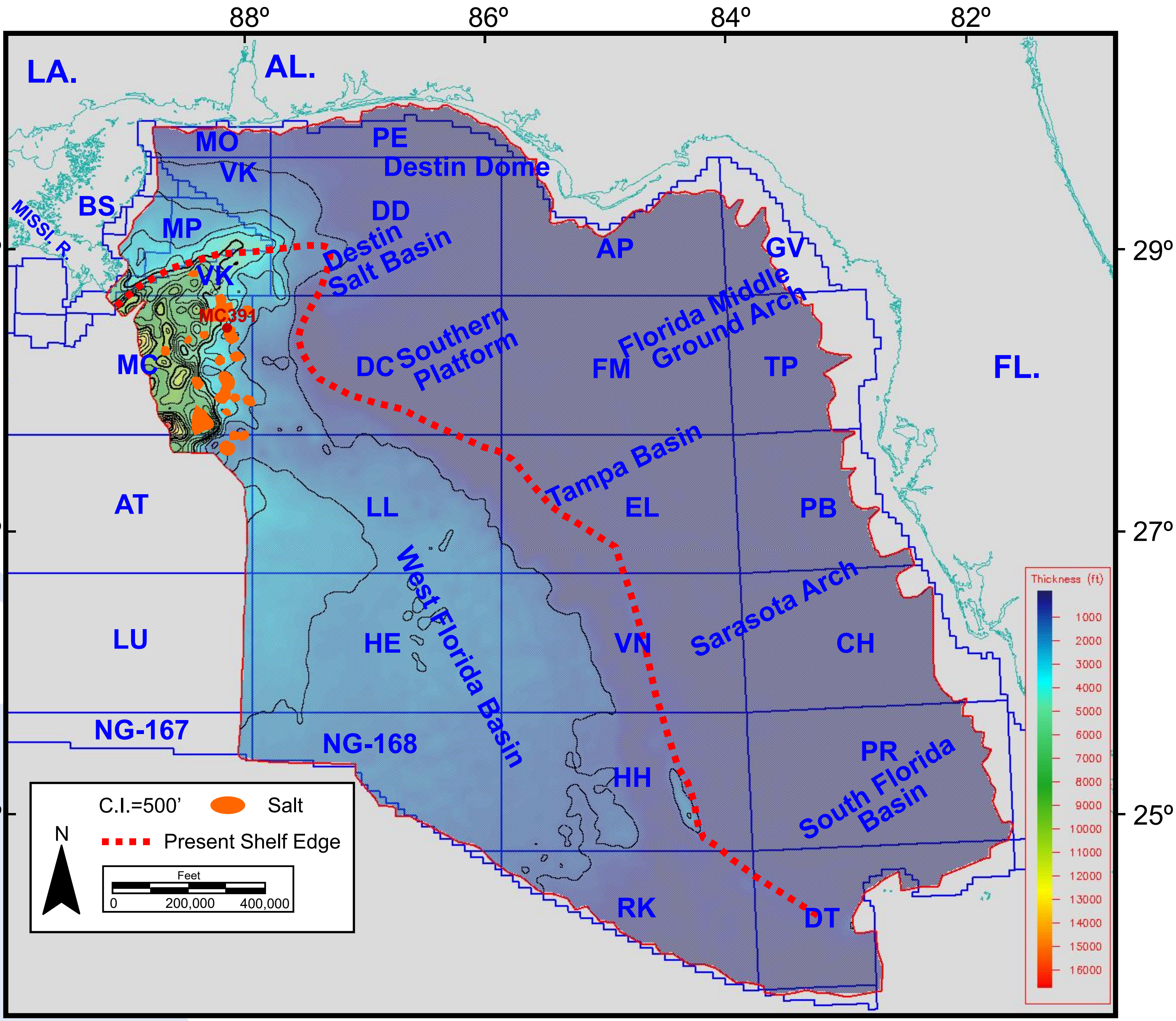


Pliocene Depisode (5.32-1.77 m.y.)

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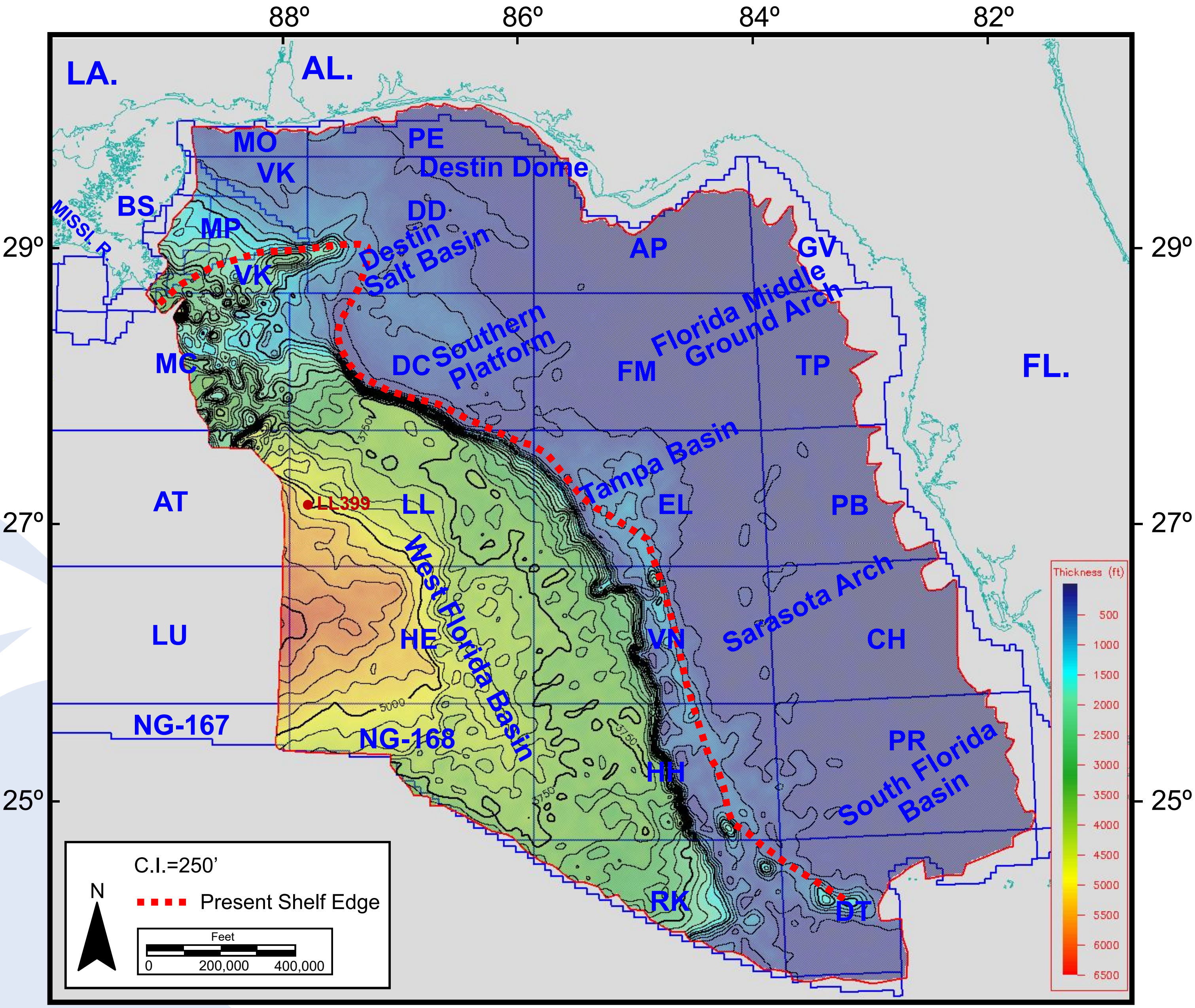


Pleistocene Depisode (1.77 m.y.-Present).

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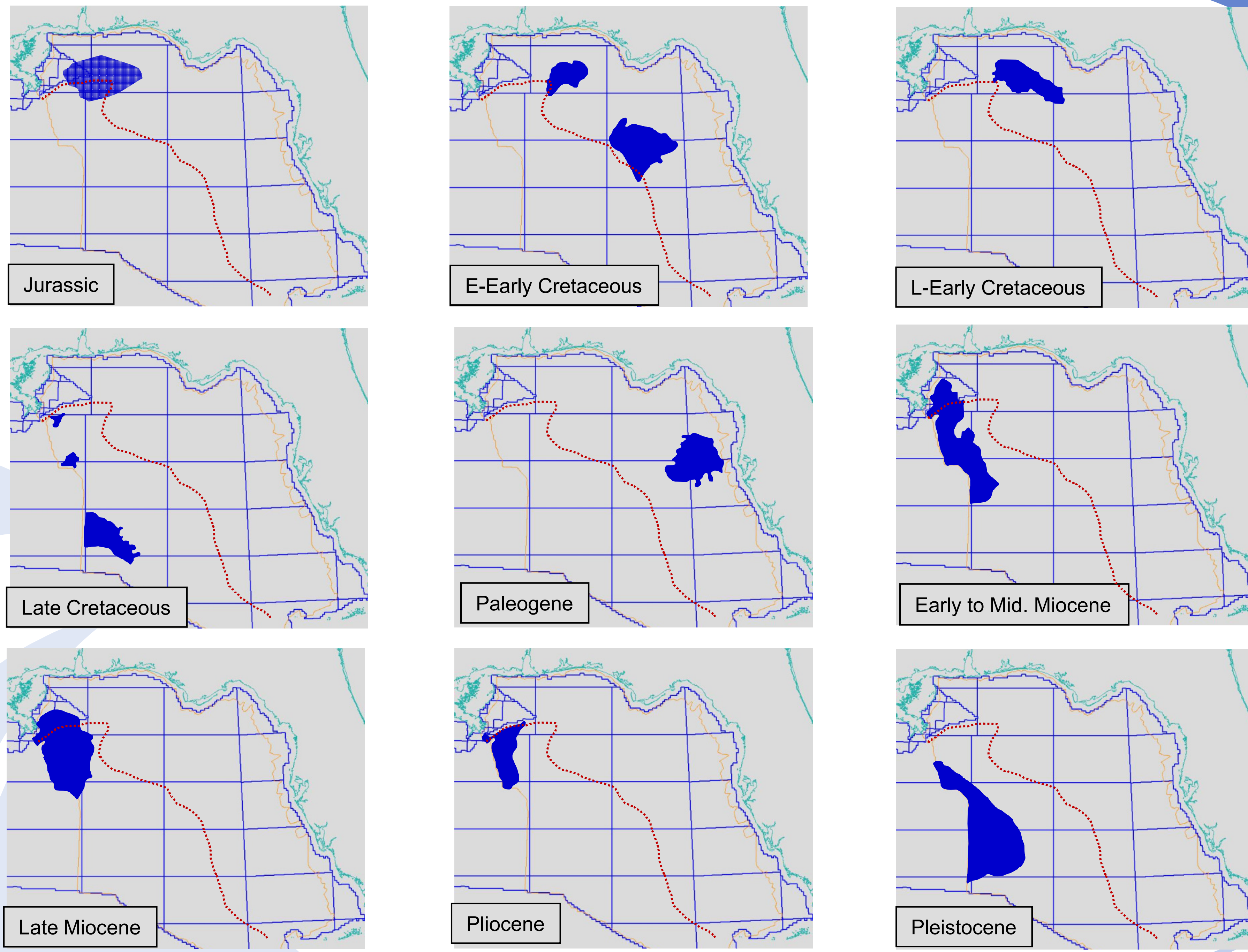


Movement of Depocenters from Jurassic to Pleistocene

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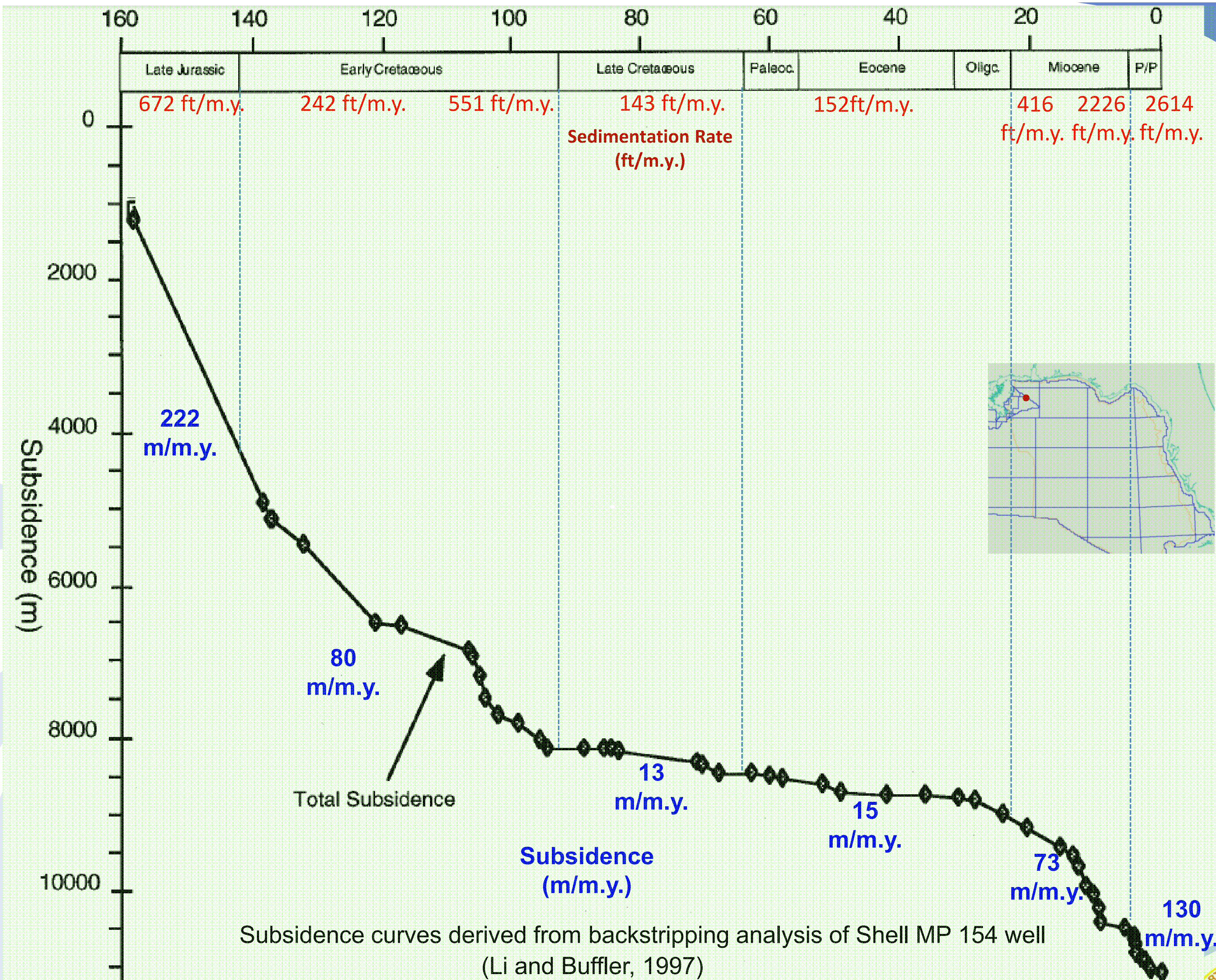


Subsidence curves derived from backstripping analysis of Shell MP 154 well
(Li and Buffler, 1997)

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# Conclusions

- Mapping of individual depisode reveals the sedimentary history of eastern Gulf Basin.
- Depocenter distribution patterns reflect sediment source origin and global sea level change. From the Jurassic depisode to the Paleogene depisode, the depocenters are primarily located landward of the present shelf edge related to the relative dominance of northern and northeastern clastics sources and highstand global sea level.
- The presence of depocenter in the West Florida basin in the late Cretaceous depisode suggests periods of lowstand sea level.
- After the Paleogene depisode, the depocenters progressively shifted basinward and appeared mainly seaward of the present shelf edge. The migrations indicate a lowstand global sea level due to the growth of Antarctic and Northern Hemisphere ice sheets and increase of tectonic subsidence. The northwestern clastics sediment source became dominant after early Miocene.
- The variation of sedimentation rate reflects tectonic subsidence and sea level history in the eastern Gulf Basin.